PATENT APPLICATION BASED ON: Docket Number 80995DMW

Inventor(s): Elizabeth Rosenzweig
Prasad V. Prabhu

Attorney: David M. Woods

Document ID: \DOCKETS\80995\

TIMELINE-BASED GRAPHICAL USER INTERFACE FOR EFFICIENT IMAGE DATABASE BROWSING AND RETRIEVAL

EASTMAN KODAK COMPANY

RESTRICTED INFORMATION

"Express Mail" mailing label number EL267106145US
Date of Deposit 20 December 2000
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to "Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231

Robin G. Reeves
(Typed or printed name of person mailing paper of fee)

Robin G. Reeves
(Signature of person mailing paper or fee)

TIMELINE-BASED GRAPHICAL USER INTERFACE FOR EFFICIENT IMAGE DATABASE BROWSING AND RETRIEVAL

FIELD OF THE INVENTION

The present invention relates to graphical user interfaces in general, and in particular to graphical user interfaces adapted for browsing and retrieval of pictures in digital picture databases.

BACKGROUND OF THE INVENTION

Digital pictures and digital picture albums/collections are proliferating with recent advances in quality and cost reductions. Digital pictures can be stored in common or individual databases that allow a user to retrieve his or her pictures for viewing and reproduction via a computer system. When a large number of pictures are stored in a collection, it is desirable to be able to browse and retrieve selected pictures with a graphical user interface (GUI). Used for such an application, a GUI conveniently organizes and groups database pictures, and allows a user to browse the pictures in one or more displays.

Along with the digital information representing pictures, digital image files can also contain metadata, or information not displayed, which nonetheless characterizes the data comprising the pictures. The metadata can describe the scene in the picture, such as a caption, and can also provide in a straightforward manner, information such as the date and time the picture was captured, the location from which the picture was captured, identify people or objects in the picture, and information regarding format and data structure.

Many prior art digital cameras can be programmed to automatically store along with the actual image, the date and time a picture was captured. More advanced digital cameras can also be programmed to automatically store along with the actual image, the location of picture capture by harnessing automatic location systems. For example, the Global Positioning Satellite (GPS) is a well-known method for pinpointing the location of a special GPS receiver with a fairly high degree of accuracy. Other methods include the use of Radio Triangulation (RT) systems. Using such an approach, a GPS receiver can be either incorporated

in the hardware of the digital camera, or located nearby. A subsequent image file will contain not only the raw image data, but also a date and time stamp, along with header information related to the location of the GPS receiver when the image is collected.

Still more advanced digital cameras may contain pattern recognition software for identifying objects and people in an image, and converting such information to metadata.

Whether metadata is entered automatically by the camera, manually via the camera during picture captures, or subsequently into the digital image database, there remains a great need for improved GUIs for efficiently and attractively arranging pictures in a digital image database. More particularly, there remains a need for improved, user-friendly GUIs that give image database users a temporal "feel" for the stored images.

SUMMARY OF THE INVENTION

To address the needs of the prior art identified *supra*, the present invention provides a graphical user interface adapted to browse and retrieve pictures stored in a digital image database. The graphical user interface includes a metadata decoder adapted to decode metadata stored in digital image files, a first display level and at least a second display level, which display levels are constructed with the aid of decoded metadata. The first display level at least includes a first timeline metaphor representing the span of time over which pictures stored in the database were captured, and a plurality of first icons placed along the first timeline metaphor representing predefined temporal intervals, the first icons being proportionately sized to correspond to the number of pictures captured during a predefined temporal interval. The second display level is linked to the first display level and is triggered by activating one of the first icons. The second display level at least includes a second timeline metaphor, and second icons placed along the second timeline for grouping the pictures represented by the activated first icon, the second icons being proportionately sized to correspond to the number of pictures captured for each grouping.

The present invention also provides a method of producing a graphical user interface (GUI) adapted to browse and retrieve pictures stored in a digital image database. The method includes the steps of decoding metadata stored in digital image files, providing a first GUI level and at least a second GUI level, which GUI levels are constructed with the aid of decoded metadata. The first GUI level at least includes a first timeline metaphor representing the span of time over which pictures stored in the database were captured, and a plurality of first icons placed along the first timeline metaphor representing predefined temporal intervals, the first icons being proportionately sized to correspond to the number of pictures captured during a predefined temporal interval. The second GUI level is linked to the first GUI level and is triggered by activating one of the first icons. The second GUI level at least includes a second timeline metaphor, and second icons placed along the second timeline grouping the pictures represented by the activated first icon, the second icons being proportionately sized to correspond to the number of pictures captured for each grouping.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will become apparent to those skilled in the art from the description below, with reference to the following drawing figures, in which:

Figure 1A is a yearly-based timeline display used in the graphical user interface (GUI) of the present invention, the timeline having chronological icons which are proportional in size to the number of pictures in a database corresponding to the identified years;

Figure 1B is an alternate decade-based timeline display suitable for use in the GUI of the present invention, the timeline having chronological icons which are proportional in size to the number of pictures in a database corresponding to the identified decades;

Figure 2A is a monthly-based display linked to the timeline in Figure 1A in general, and in particular to a year specified by a user;

Figure 2B is a yearly-based timeline display linked to the timeline in Figure 1B, which has chronological icons which are proportional to the number

of pictures in a database corresponding to the years in a decade specified by a user;

Figure 3 is a weekly-based (Sunday through Saturday, etc.) display linked to the timeline in Figure 2A in general, and in particular to a month specified by a user;

Figure 4 is a daily-based (by hour of the day) display linked to the timeline in Figure 3 in general, and in particular to a day of the week specified by a user;

Figure 5 is an alternate daily-based (by blocks of time) display linked to the timeline in Figure 3 in general, and in particular to a day of the week specified by a user;

Figure 6 is an event-based display linked to the timeline in Figure 2A in general, and in particular to a month specified by a user;

Figure 7 is an alternate embodiment (vertical) of the display in Figure 6;

Figure 8 is a location-based display linked to the timeline in Figure 2A in general, and in particular to a year specified by a user;

Figure 9 is a person-based display linked to the timeline in Figure 2A in general, and in particular to a year specified by a user;

Figure 10 is a thumbnail display of pictures in a database that are linked to the timeline displays of the previous drawing figures; and

Figure 11 is a conceptual block diagram of a system used for producing a GUI according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As will be described below in more detail, the present invention novelly provides a graphical user interface (GUI) which uses a series of linked timeline metaphors with proportionately (with respect to the number of pictures represented by the icon, as will be explained, *infra*) sized icons to represent the pictures in a digital image database. It will be appreciated by those skilled in the art that the pictures in the image database can be entered by a variety of means,

including, *inter alia*, pictures captured by digital cameras, analog pictures which are quantized into digital images, and images produced by image scanners.

The first level of the GUI of the present invention contains a timeline metaphor (displayed for the user) such as the one 100A in Figure 1A, or the one 100B in Figure 1B. The timeline metaphor 100A is marked by the years (of capture) covered by the pictures of the database in question. In an alternate embodiment, the timeline metaphor 100B is marked by the decades (of capture) covered by the database pictures. More particularly, the timeline 102A has year-picture icons 104A evenly spaced with year markers, while the timeline 102B has decade-picture icons 106B evenly spaced with decade markers.

Although shown as circular in shape, the icons 102A can be of any other suitable shape, including (but not limited to) spherical, elliptical, or irregular. More important to the present invention than the shape of the icons 104A and 106B is the fact that the icons are sized to show the relative number of pictures represented by the corresponding time markers. For example, the sample digital image database contains many more pictures captured in the year 2001 than in the year 2000. Consequently, the icon representing to the year 2001 is relatively large, while the icon representing the year 2000 is relatively small. In the alternate embodiment of Figure 1B, the number of pictures in the sample database captured in the 1991-2000 decade are relatively large, while the number of pictures captured in the 1941-1950 are relatively small. Consequently, the icon sizes are relatively large, and relatively small, respectively.

To move to the next level of the GUI of the present invention, a user activates one of the year (or decade) icons in Figures 1A or 1B to produce a new timeline metaphor 200A or 200B shown in either Figures 2A or 2B for greater temporal specificity. Just as with Figures 1A and 1B, the timeline metaphors 200A and 200B contain timelines and relatively sized picture icons.

In the example shown in Figure 2A, the user has activated (by a click of a pointing device such as a "mouse," for example) the year 2000 icon as being of further interest. That is, the user is interested in browsing pictures captured in the year 2000. The new timeline 202A further refines the year 2000 into the months of the year. From the example, it is apparent by the relative size of the

icons 204A, that many more pictures were captured in the month of December than in the Month of May. In the alternate timeline metaphor 200B of Figure 2B, the user has chosen to further refine the timeline metaphor of Figure 1B, by showing the year-picture icons 208B on the timeline 206B to display the relative size of pictures captured for each of the years in the 1991-2000 decade. In this example, the pictures captured in the year 1999 are much more numerous than the pictures captured in the year 2000, so that the relative sizes of the corresponding icons are large and small, respectively.

Activating an icon representing the picture grouping of interest can further refine the timeline metaphors of each level of the present-inventive GUI. The timeline metaphor 300 in Figure 3 is linked to either the timeline metaphor 200A or 200B, and groups the pictures in the image database according to the days of the week with a timeline 302 and day icons 304, which are, again, proportionately sized to represent the relative number of pictures grouped according to the days of the week. The timeline metaphor 400 in Figure 4 is linked to the timeline metaphor 300 in Figure 3, and groups the pictures in the image database according to the time of day with a timeline 402 and day icons 404. In the example shown, the pictures captured on all Mondays are grouped according to their capture time. An alternate embodiment of the timeline metaphor 400 in Figure 4 is the timeline metaphor 500 in Figure 5, where instead of grouping the pictures of a particular day by the hour of capture, the pictures are grouped by a block of time.

The GUI of the present invention allows a user to display metaphors which group the pictures in a digital image database in other ways besides the date or time of capture by linking timeline metaphors to other metaphors. The display line 602 in Figure 6 displays proportionately sized icons 604 which group the database pictures according to events specified by a user inputting the pictures. Linked to the timeline metaphor 200A in Figure 2A, the metaphor 600 in Figure 6 groups the pictures captured in a particular month—December in the example—into identifiable events, such as birthdays, holidays, etc. For example, the "Event 11" icon might represent pictures captured on Christmas Day, while the "Event 12" icon might represent pictures captured on New Year's Eve.

While the metaphors of the GUI of the present invention might generally be oriented in a common direction, different levels might be displayed in an orthogonal direction relative to previous linked levels, such as the metaphor 700 in Figure 7, which might be linked to the timeline metaphor 100A in Figure 1A.

In addition to grouping pictures according to specific events, the GUI of the present invention can also provide linked views which group database pictures according to stored characteristics such as the location of capture, and identifiable persons in pictures. The display 800 in Figure 8 is an example of a line 802 with proportionately sized location icons 804 linked to a particular year (2000 in the example) on the timeline 102A in Figure 1A. It is apparent from Figure 8 that the many more pictures were captured at "Location 5" than at "Location 4."

The display 900 in Figure 9 is an example of a line 902 with proportionately sized "people" icons 904 linked to a particular year (2000 in the example) on the timeline 102A in Figure 1A. It is apparent from Figure 9 that the many more pictures were captured of "Person 5" in that year than of "Person 4." For example, "Person 5" might be a newborn baby, while "Person 4" might be a person who often takes pictures, but seldom has pictures taken of himself/herself.

When there are no more timeline metaphors, or other picture grouping metaphors after a given level in the present-inventive GUI has been reached, or when desired by the user (if the viewing screen does not become undesirably cluttered), the next level is a display 1000 in Figure 10 showing thumbnails representing all of the pictures currently grouped. For example, if the user activates the "Person 2" icon in the display 900 in Figure 9, thumbnails of all of the pictures captured during the particular year (2000 year in the example), and featuring or including "Person 2" are displayed.

Given the disclosure of this Letters Patent, those skilled in the art will be able to implement a timeline-based GUI for more efficient and user-friendly browsing and retrieval of pictures stored in an image database. However, a general system 1100 for implementing the present invention is illustrated in Figure 11. The various components of the system 1100 need not have physical

proximity. Indeed, the system 1100 can be self-contained in a stand-alone computer system, part of a Local Area Network (LAN), or part of a remote processing system using Wide Area Networks (WANs) such as the Internet, to name a few variations.

The system 1100 includes central control 1106 to control its overall operation, a large image file memory 1102 for storing the digital pictures of a picture database, along with metadata for each picture, and a metadata decoder 1104 for decoding metadata from the image files for use by the system 1100. A GUI generator 1108 generates the display metaphors of the present invention for display via a display 1110 under the direction of a user input 1112 and the central control 1106.

Variations and modifications of the present invention are possible, given the above description. However, all variations and modifications which are obvious to those skilled in the art to which the present invention pertains are considered to be within the scope of the protection granted by this Letters Patent.

Sony Ex. 1008 - Page 169

PARTS LIST

100A Timeline metaphor
102A Timeline (years)
104A Year-picture icons
100B Timeline metaphor
102B Timeline (decades)
106B Decade-picture icons
200A Timeline metaphor
202A Timeline (year, months)
204A Month-picture icons
200B Timeline metaphor
206B Timeline (decade, years)
208B Year-picture icons
300 Timeline metaphor
302 Timeline (month, days)
304 Day-picture icons
400 Timeline metaphor
402 Timeline (day, time)
404 Time-picture icons
500 Timeline metaphor
502 Timeline (day, time block)
504 Time block-picture icons
600 Timeline metaphor
602 Timeline (month, events)
604 Event-picture icons
700 Timeline (vertical) metaphor
702 Timeline (year, events)
704 Event-picture icons
800 Timeline metaphor
802 Timeline (year, locations)
804 Location-picture icons
900 Timeline metaphor

Google-Exhibit 1008 - Page 9 of 20

902 Timeline (year, people)

904 People-picture icons

1000 Thumbnail display

1100 Timeline-based Graphical User Interface (GUI) system

1102 Image file memory

1104 Metadata decoder

1106 Central control

1108 GUI generator

1110 Display

1112 User input

Serial No. 10/750,028 - Docket No. 200313